622X
622M cross-connected SDH Optical Transmission System

User’s Manual

V1.11

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Revision History

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Abbreviations

ADM	**Add-Drop Multiplexer**
AIS	**Alarm Indication Signal**
ALS	**Automatic Laser Shutdown**
APS	**Automatic Protection Switching**
AU	**Administrative Unit**
AUG	**Administrative Unit Group**
BER	**Bit Error Ratio**
BLSR	**Bidirectional Line Switched Ring**
SES	**Severely Error Seconds**
DCC	**Data Communications Channel**
DEG	**Degraded**
DXC	**Digital Cross Connect**
ES	**Error Second**
ID	**Identifier**
LC	**Link Connection**
LOF	**Loss Of Frame**
LOM	**Loss Of Multi-frame**
LOP	**Loss Of Pointer**
LOS	**Loss of Signal**
LP	**Lower order Path**
LTI	**Loss of all Incoming Timing references**
MCF	**Message Communications Function**
MS	**Multiplex Section**
MSOH	**Multiplex Section Overhead**
NDF	**New Data Flag**
NE	**Network Element**
NNI	**Network Node Interface**
NU	**National Use**
OFS	**Out-of-Frame Second**
OOF	**Out Of Frame**
OW	**Order Wire**
PDH	**Pre-synchronous Digital Hierarchy**
PLM	**Payload Mismatch**
PPI	**PDH Physical Interface**
PJE	**Pointer Justification Event**
POH	**Path Overhead**
PTR	**Pointer**
RDI	**Remote Defect Indication**

REI	**Remote Error Indication**
RS	**Regenerator Section**
RSOH	**Regenerator Section Overhead**
SD	**Signal Degrade**
SDH	**Synchronous Digital Hierarchy**
SEC	**SDH Equipment Clock**
SES	**Severely Error Second**
SETS	**Synchronous Equipment Timing Source**
SPI	**SDH Physical Interface**
SNC	**SubNetwork Connection**
SOH	**Section Overhead**
SSM	**Synchronization Status Message**
STM	**Synchronous Transport Module**
TIM	**Trace Identifier Mismatch**
TMN	**Telecommunications Management Network**
TS	**Time Slot**
TU	**Tributary Unit**
TUG	**Tributary Unit Group**
ULSR	**Unidirectional Line Switched Ring**
UNEQ	**Unequipped**
UNI	**User Network Interface**
USR	**User channels**
VC	**Virtual Container**

1. Introduction

1.1 Overview

RSM-622X (STM-4) optical synchronous transmission system is one of the Raycom's important members of transmission equipment , which comply with the Synchronous Digital Hierarchy (SDH) defined in ITU-T Recommendation G.707. It features high degree of integration, exquisite conformation, flexible networking, strong network adaptability, and other advantages. It is also comply with requirements of vibration, radiation, as well as electromagnetic compatibility, and other multiple international specifications.

RSM-622X provides two 622.080Mb/s optical interfaces called E and F, and four 155.520155.520Mb/s optical interfaces of A, B, C, D. It also provides Network Elements (NE) timing function of ITU-T G.813 standard, 14×14 VC4 fully cross connection and channel protecting function with cross granularity as VC4, VC3 and VC12.

RSM-622X can either work together with RSM-155 series SDH equipments, as Add-Drop Multiplexer (ADM) , as a Terminal Multiplexer (TM) or as a mini local cross-connect for applications in linear links, rings, and meshed networks.

RSM-622X can also serve as Digital cross connecting equipment when working with SDH device other manufacturers, and can achieve a smooth upgrade from STM-1 to STM-4, while producing no impact on the existing NM system.

The NE management of RSM-622X system is based on a unified Network Management System – EasySDH. EasySDH is designed in accordance with ITU-T related recommendations, to achieve management on network resources, equipment configuration, alarm, performance, and security. It is also able to support the unified management of subnetworks, with multiple optical paths which are not mutually connected, to support remote network monitoring and control by Internet.

1.2 Product Features

- ◆ Single board, with 1U height
- ◆ Four STM-1 optical interfaces work independently or be set as 1+1 ring protection
- ◆ Two STM-4 optical interfaces work independently or be set as 1+1 optical ports protection
- ◆ Standard SEC (SDH Element Clock) recommend by ITU-T G.813, synchronization timing interface, SSM function and automatic switching of multiple timing reference
- ◆ Supports clock modes of tracing (locked), free run and holdover
- ◆ Non-blocked cross connection among six optical interfaces, the granularity of which are VC4, VC3 and VC12
- ◆ Point-to-point, chain and ring topologies.
- ◆ Provides D1~D3 bytes of the ECC channel and TCP/IP as the network management protocol

- ◆ Provides F (Ethernet) and f (RS232) NMS interface, network management platform EasySDH. Realizes the resources, configuration, alarm, performance and security functions proposed by ITU-T standards
- ◆ Embedded network management software supports remote upgrading
- ◆ Optional optical module of long/short distance and ALS/Non-ALS function

1.3 Compliant Technical Specifications and Standards

G.703	Physical/Electrical Properties of Digital Interfaces for Digital Transmission Terminal Equipment
G.707	Network Node Interface of Synchronous Digital Hierarchy (SDH)
G. 781	Composition of Related Recommendations for SDH Multiplexing Equipment
G. 782	Related Types and General Properties of SDH Multiplexing Equipment
G. 783	Function Block Properties of SDH Multiplexing Equipment
G.784	SDH Management
G.803	SDH's Transmission Network Structure
G. 811	Timing Requirements of Clock Output Terminal and Network Nodes Applicable to international digital link PHD Operation
G. 813	SDH Equipment Secondary Clock (SEC) Properties
G.823	Jitter and Drift Control in Digital Network Based on 2048Kb/s System
G. 825	Jitter and Drift Control in Digital Network based on SDH
G. 826	Bit Error Properties and Targets of Primary Group and above International Fixed Rate Channels
G. 841	Types and Properties for Protection of SDH Networks in Different Structures
G. 957	SDH-Related Optical Interfaces of Equipment and Systems
G. 958	SDH Based Fiber Cable Digital Line Systems

The Ministry of Information Industry "Optical Synchronous Transmission Network Technical System"

Governmental Standard "SDH Fiber Cable Line System Network Access Requirements"

2. Front Panel

2.1 Front Panel Introduction

The front panel is arranged with STM-1 optical interface, equipment operating and alarming LED, management interface and mask switch of alarm voice, etc.

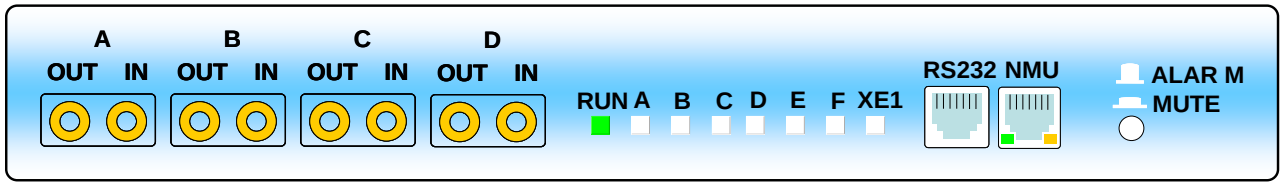

Fig.2-1-1 Front panel of 622X

Table 2-1-1 Front panel ports and mask switch

Name	Description	Remark
OUT	STM-1 optical output	
IN	STM-1 optical input	
RS232	Serial NM and user transparent channel interface	RJ45 port, serial NM and user transparent channel cable. Note: the cable is not in the packing list, it should be made by customer
NMU	Network management interface	RJ45 port, use CAT-5 cross or straight cable. Note: the cable is not in the packing list, it should be made by customer.
Mask switch	ALARM（the button is up）:Enable the alarm voice	
	MUTE （ the button is push down）:mask the alarm voice	

Table 2-1-2 Front Panel indicators

Name	Description
RUN	Run indicator, Green. Lighting means work well.
A/B/C/D/E/F	Optical Interface Status Indication. Off indicates that this optical interface does not exist, green indicates normal operation, red means urgent alarm, and yellow stands for delayed alarm.
XE1	Status Indication of extended service card. Not use temporarily.

Table 2-1-3 Urgent Alarm and delayed Alarm

Name	Description
Equipment Urgent Alarm	The default urgent alarm including: NOP (NO Power) LOF (Loss of Frame) MS_EXC (Multiplex Section Excessive errors) AU_LOP (Administrative Unit Loss of Pointer) HP_PLM (Higher order Path Payload Mismatch) HP_TIM (Higher order Path Trace Identifier Mismatch) HP_EXC (Higher order Path Excessive errors)) TU_LOP (Tributary Unit Loss of Pointer)
Equipment Delayed Alarm	The default delayed alarm including: MS_AIS (Multiplex Section Alarm Indication Signal) MS_RDI (Multiplex Section Remote Defect Indication) MS_DEG (Multiplex Section Degraded) HP_AIS (Higher order Path Alarm Indication Signal) HP_RDI (Higher order Path Remote Defect Indication) TU_AIS (Tributary Unit Alarm Indication Signal) LTI (Loss of all main Incoming Timing references)

2.2 Serial NM and User Channel（RS232）

622X provide RJ-45 interface, used for serial network management and user channel.

Table 2-2-1 Cable order of Serial network management and user channel

Pin	Definition	Remark
PIN1	RSNM-OUT	Serial NM Channel output (RS232 Voltage）
PIN2	RSNM-IN	Serial NM Channel input (RS232 Voltage）
PIN3	-	Null
PIN4	-	Null
PIN5	-	Null
PIN6	GND	Signal GND
PIN7	Data-IN	Serial data input（RS232 Voltage）
PIN8	Data-OUT	Serial data output（RS232 Voltage）

2.3 Ethernet NM Interface

Besides the RS232 Serial NM Interface，RSM-622X also provides an Ethernet NM interface called NMU, Either standard cross network cable or through one can be used in the connection between the interface and the NMS The cable order will not be described here

The customer can change the mac and ip address of the equipment to fulfill the application, refer to the "EasySDH user manual" for more information.

3. Rear Panel

3.1 Rear Panel Introduction

The following is a schematic diagram for rear panel of RSM-622X equipment, with power interface, address switch, and STM-4 optical interface, etc.

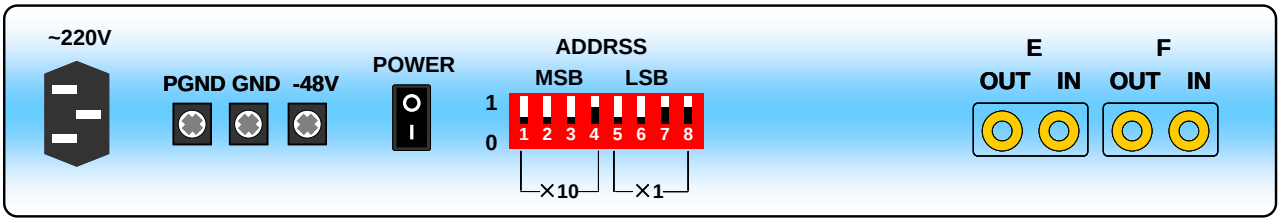

Fig 3-1-1 Rear Panel of 622X

3.2 Power Supply Interface

The device provide two power supply interface, AC220V and DC-48V, the default is DC-48V. The AC 220V power interface should be declare in the order.

Note: AC220V and DC-48V cannot be used at the same time!

3.3 NE Address

The range of the device address is from 00 to 98, which is set by the address switch on the rear panel. The device address is unique mark used for network element management, Different device in a network can not be set to the same address, otherwise, the management system can't achieve the successful access to it.

As described in the following figure, the left 4-position of the switch is for the tens digit of the address called MSB, while the right 4-position is for the unit digit called LSB, both of which are in 8421 BCD code mode.

Take the example of the figure, the address is "11"

Fig 3-3-1 Setting of NE Address

3.4 STM-4 Optical Interface

The two STM-4 optical interfaces of RSM-622X locates on right side of the back panel with SC type, and customer shall declare during ordering if FC type interface is needed.

4. Function Structure

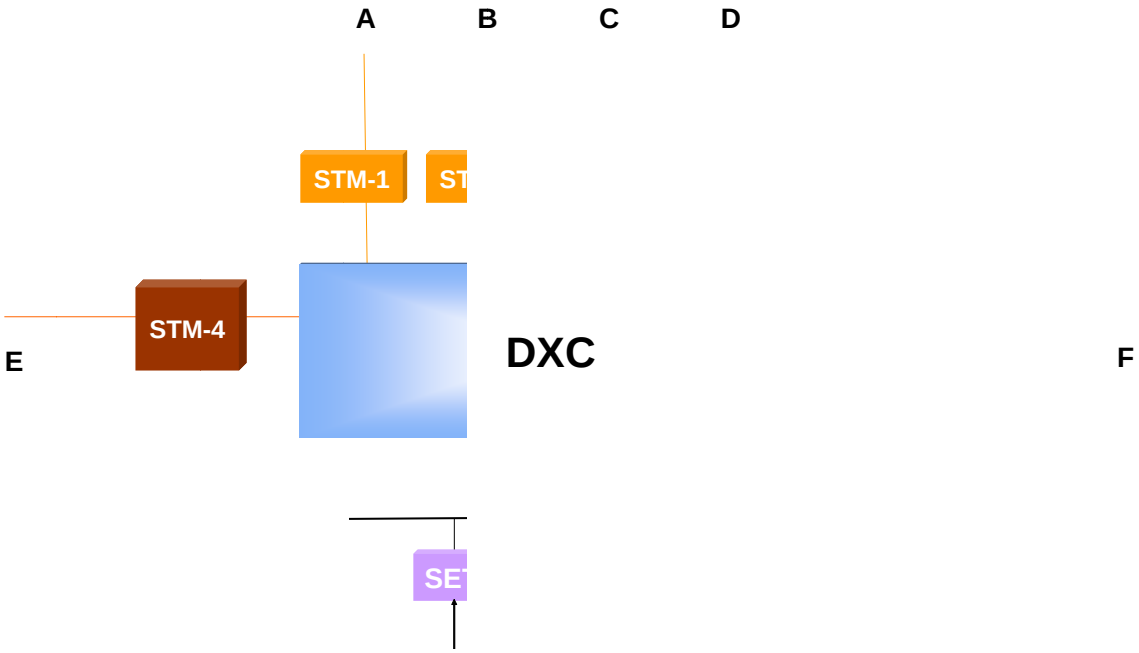

Fig 4-1 RSM-622X Functional Block

RSM-622X system includes two STM-4 optical interface units, four STM-1 optical

interface units, functional modules of data cross connection（DXC）, overhead transaction（SOT）, equipment timing source(SETS), management unit(NMU) and etc.

4.1. STM-4/1 Optical Interface Unit

It fulfills process of STM-1/STM-4 optical signal in SDH system, including the section overhead (SOH) and high-order channel overhead process, pointer process, TU pointer alignment (TUPP) and so on.

It can achieve automatic laser shutdown (ALS) function or super-long distance transmission by changing particular optical module, which physical interface can be FC or SC.

4.2. DXC (Data Cross Connection) Unit

It is able to achieve cross-through, broadcast, add/drop and loop cross connection. Any cross connection mode can be achieved for service entering into the lines and the tributaries inside the equipment.

For the convenience of application, the four VC4s of the E optical interfaces (STM-4) are defined as E_1, E_2, E_3, and E_4 in turn, and the four VC4s of F optical interface (STM-4) as F_1, F_2, F_3, and F_4, respectively.

The equipment default configuration is ， E and F optical interfaces are in mutual protection，all service channels are TU-12, four STM-1 optical interfaces of A to D are independent for adding and dropping service, respectively cross connect with E_1 (F_1), E_2 (F_2), E_3 (F_3), and E_4 (F_4), as indicated in the following figure.

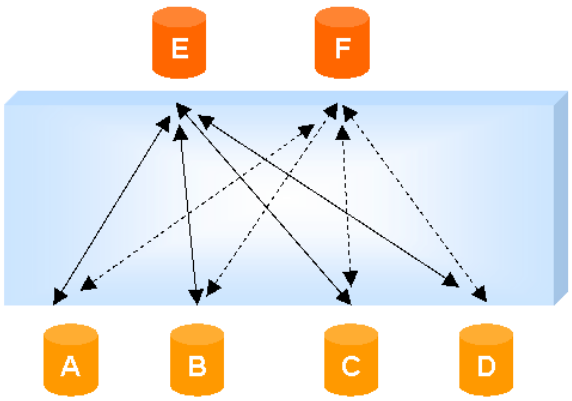

Figure 4-2 Default Configuration of Cross Connection

4. 3.SOT (Segment Overhead Terminal) Segment Overhead Terminal Unit

It is to achieve termination and insertion for the part of segment overhead. One RS-232 bus channel is provided, using F1 of overhead for transmission. The option for service initiating site "F1 Transmission Enable" must be set as Disable in application, and that for other sites are to be set as Enable. And ensure that there is only one site which send data to the bus at any moment.

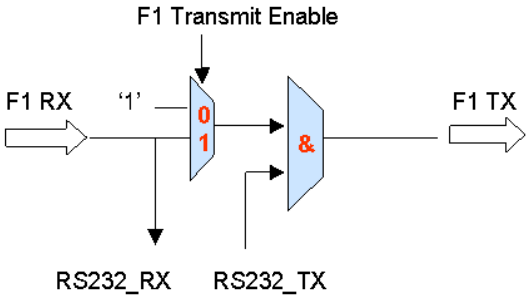

Figure 4-3 User Channel Forward Enabling Configuration

DCC channel ， which occupy D1~D3, used for communication of network elements.

EOW interface is not provided by the equipment; however, when connecting with other SDH equipment of our company, E1 overhead byte used for EOW can be configured automatically, to ensure that original telephone system can operate normally.

Additionally, to have no impact on the NM system of other manufacture whose equipment connected with RSM-622X, standby overhead of E1'/F1'/D1'~D3' used for NM are provided .The "route way settings" is set to be "non standard" through NM to realize the usage of standby overhead.

4.4 SET (SDH Equipment Timing) Equipment Timing

It is to provide interface for external timing signals and the timing source of equipment, to give a timing reference to different functional modules of SDH equipment.

It provides a selective clock function of different priority, using S1 byte, as well as complete function for synchronous status messages (SSM), to ensure the reliable operation of clock. It can track A, B, C, D, E, and F six line timing sources (LTS), and is able to achieve automatic switch based on quality levels of timing source.

4.5. NMU (Network Management Unit) Network Management Unit

It fulfill the management of the equipment and communications between network elements, and provide an Ethernet interface and an RS-232 interface for access.

5. Networking Application

5.1 Direct Upgrade of Existing STM-1 Network to STM-4 Network

Establishing on the existent STM-1 equipment by STM-1 optical interface, RSM-622 X is able to upgrade the original STM-1 network to STM-4 network, so as to enlarge transmission capacity.

If the original STM-1 is an equipment of another manufacturer, overhead mode can be set through NM software, to retain the NM system of the original equipment.

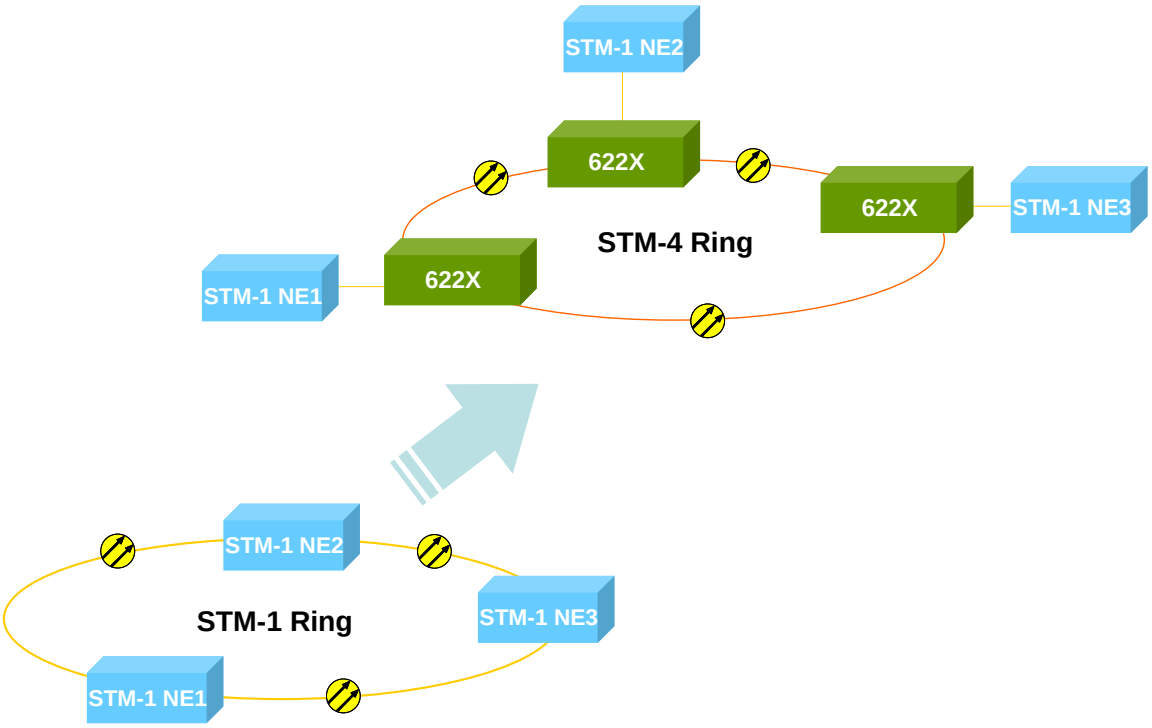

Fig 5-1 Networking Application 1

5.2 Realization of E1 Tributaries Access into STM-4 Loop

The four STM-1 optical interfaces provided by RSM-622X, can serve as up and down optical tributary services, in cooperation with RSM-155C/CP, and can provide up to 252 E1.

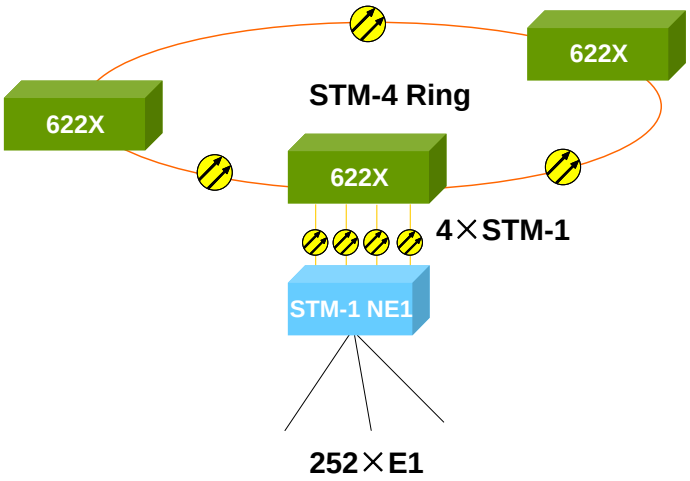

Fig 5-2 Networking Application 2

6. Equipment Grounding

As a small-sized equipment, RSM 622X ground is divided into two types-working ground and protection ground. When equipment runs normally, it is necessary for GND and PGND to be connected with the earth. The PGND resistance shall be not more than 4Ω and

the minimum cross section of GND wire should not be less than 6mm^2, so as to provide essential conditions for safe and stable operation.

NOTE: The PGND of the equipment has been connected to the box defaultly.

Please refer to the following figure to complete the connection

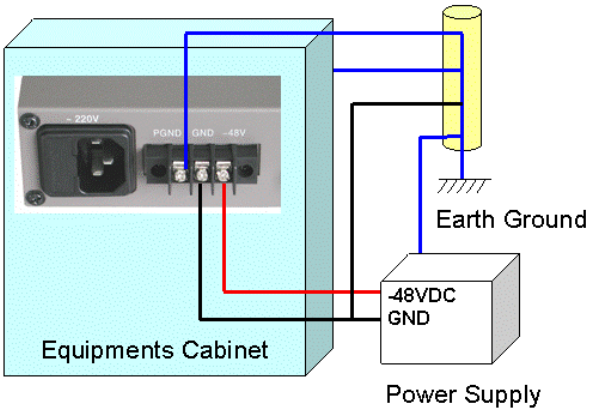

Fig 6-1 Equipment External Grounding

7. Installation of NM System

"Easy SDH^{TM} NM System User Manual" must be referred to before the installation of Easy SDH^{TM} NM system, and the equipment IP address shall be set as the advance customer IP address assignment. Login in the software, and the default account is Administrator, with the password is null. Please enter into user management for account adding or deleting and password modifying if necessary.

Pay attention that the default IP address of the equipment is 192.168.0.157. The address of NM PC shall be set and kept at the identical IP segment.

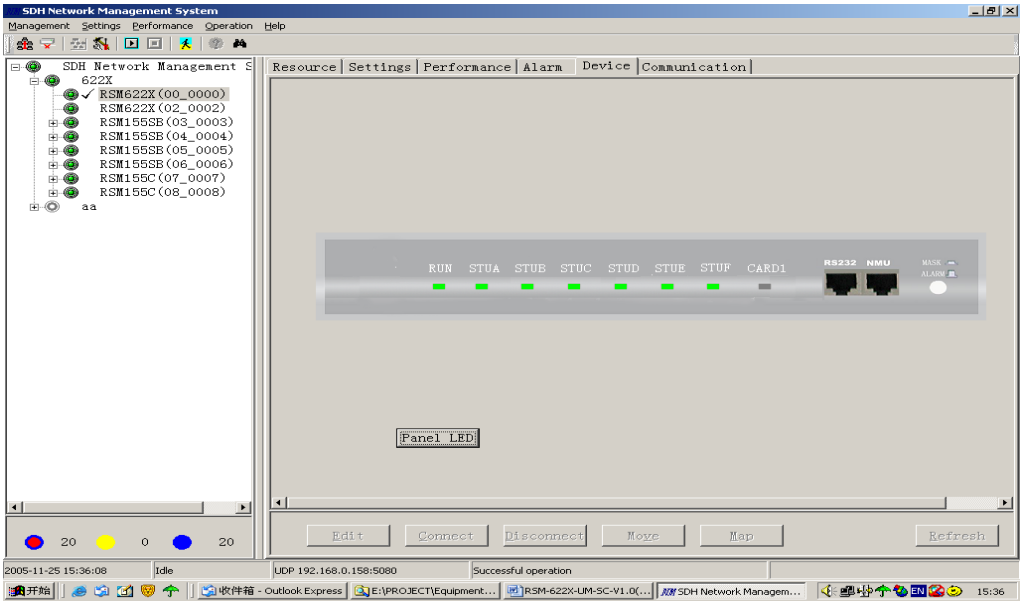

Fig 7-1 EasySDH^{TM} NM System Main Interface

8. MAC address

The device is assigned by a unique MAC Address in the world, which was stunk on the

side face of the device.

9. Technical Parameters

Table 9-1 STM-1 Optical Interface Technical Indices

Working Wavelength	1310nm
Rate	155.520Mb/s± 4.6ppm
Standard	ITU-T G.957/G.958
Type of Medium	ITU-T G.652/G.653, Single-mode
Transmission Distance	40Km (Optional for long-distance transmission, and user must specify during ordering.)
Receiving Sensitivity	prior to –36dB
Adapter	FC (optional for SC interface ,and user must specify during ordering)

Table 9-2 STM-4 Optical Interface Technical Indices

Wavelength	1310nm
Rate	622.080Mb/s±4.6ppm.
Standard	ITU-T G.957/G.958.
Type of Medium	ITU-T G.652/G.653, Single-mode
Transmission Distance	40Km (optional for long-distance transmission, and user must specify during ordering)
Receiving Sensitivity	prior to –28dB
Interface	SC, optional for FC interface, and user must specify during ordering.

Table 9-3 Serial NM Interface (RS232)

Rate	19200b/s
Interface	RJ45

Table 9-4 Ethernet NM Interface (NMU)

Mode	10/100Mb/s, Half/Full duplex autonegotiation
Interface	RJ45

10. Physical Dimension and Environmental Requirements

Table10-1 Physical Dimension

Size	483mm (L) x 290mm (W) x 44mm (H)
Weight	4.0kg

Table10-2 Environmental Requirements

Project	**parameters**

Power Supply	DC：-36V～-72V；AC：176V～275V
Power consumption	35W±10%
Operating temperature	0～45°C
Relative Humidity	≤90％（Non-condensing）
Air Pressure	70～106Kpa
Environmental Air	be away from corrosive, solvent gases, dust, and not adjacent to strong magnetic field.
Grounding requirement	Resistance : ≤4Ω

Appendix 622X device fittings table

No	Name	Specification	quantity	Remarks
1	Fuse	3A	1	
2	Modular plug	RJ-45	3	
3	200V power cable		1	Used in Double power supply